What is claimed is:

1. An optical switch comprising:

a mounting substrate

a micro-electro-mechanical system ("MEMs") die mounted on an edge to the mounting substrate, the MEMs die including a mirror movably attached to a base portion of the MEMs die with a flexure hinge, the mirror moving from a first position to a second position in a plane essentially normal to a major surface of the mounting substrate;

an input port disposed to couple an optical signal to

a first output port when the mirror is in the first position and to couple the optical signal to

a second output port when the mirror is in the second position.

2. The optical switch of claim 1 wherein the mirror is formed on a smoothed major crystal plane of a layer of single-crystal silicon and has a reflectivity greater than 96%.

3. The optical switch of claim 1 wherein the input port provides the optical signal to the mirror in the second position at an angle of between about 15-45 degress from a normal of the mirror.

4. The optical switch of claim 1 wherein the input port provides the optical signal to the mirror in the second position at an angle of less than about 22.5 degrees from a normal of the mirror.

5. The optical switch of claim 1 wherein the mirror has a first mirrored surface and a second mirrored surface, the second mirrored surface being opposite the first mirrored surface, and further compising

a second input port disposed to optically couple a second optical signal to the first output port when the mirror is in the second position.

6. A micro-electro-mechanical system ("MEMs") optical cross connect comprising:

a mounting substrate having a mounting surface;

a first MEMs optical switch cell affixed to the mounting surface on an edge of the first MEMs optical switch cell and aligned to direct a first optical beam

propagating along a beam path from a first optical input to a first optical output when a first optical switching element of the first MEMs optical switch cell is in the beam path; and

a second MEMs optical switch cell affixed to the mounting surface and aligned to direct the first optical beam from the first optical input to a second optical output when a second optical switching element of the second MEMs optical switch cell is in the beam path and the first optical switching element is rotated in a plane essentially normal to the mounting surface out of the beam path.

7. The MEMs optical cross connect of claim 6 wherein the first optical switching element comprises a reflector.

8. The MEMs optical cross connect of claim 6 wherein the first optical switching element comprises a metallic mirror.

9. The MEMs optical cross connect of claim 8 wherein the metallic mirror has a minimum face dimension greater than about 400 microns.

10. The MEMs optical cross connect of claim 9 wherein the metallic mirror has an oval shape of about 550 microns by about 780 microns.

11. The MEMs optical cross connect of claim 9 wherein the metallic mirror has an oval shape of about 1.0 mm by about 1.4 mm.

12. The MEMs optical cross connect of claim 6 wherein the first MEMs optical switch cell is a latching optical switch cell configured to maintain the first optical switching element in a first position in a first switch state and in a second position in a second switch state without applied electrical power.

13. The MEMs optical cross connect of claim 6 wherein the first optical switching element is a two-sided mirror having a first mirrored side and a second mirrored side, the first optical beam reflecting off the first mirrored side of the two-sided mirror when the two-sided mirror is in the beam path and further comprising

a second optical input disposed to provide a second optical beam to the second mirrored side of the two-sided mirror when the two-sided mirror is in the beam path, the second optical beam being reflected off the second mirrored side to

a third optical output wherein the first optical beam optically couples to the third optical output when the first optical element and the second optical element are both switched out of the beam path.

14. The optical cross connect of claim 13 wherein the first mirrored side has a reflectivity greater than 96% and the second mirrored side has a reflectivity greater than 96%, each of the first mirrored side and the second mirrored side being formed on a smoothed major crystal plane of a layer of single-crystal silicon.

15. The optical cross connect of claim 6 wherein the first optical input is disposed between 12-57 mm from the first optical output.

16. A micro-eletro-mechanical system ("MEMs") optical cross connect comprising:

a mounting substrate having a mounting surface;

a first MEMs die mounted on a first edge to the mounting surface and having a first mirror disposed to rotate in a plane essentially normal to the mounting surface and extending at least about 400 microns above a second edge of the first MEMs die when the mirror is in a first position and being retracted below the second edge of the first MEMs die when the first mirror is in a second position, the first mirror reflecting a first optical beam from

a first optical input to

a first optical output when the first mirror is in the first position, the first optical beam coupling to

a second optical output when the first mirror is in the second position; and

a second MEMs die mounted on a third edge to the mounting surface and having a second mirror disposed to rotate in a plane essentially normal to the mounting surface and extending at least about 400 microns above a fourth edge of the second MEMs die when the mirror is in a third position and being retracted below the fourth edge of the second MEMs die when the second mirror is in a fourth position, the second mirror reflecting the first optical beam from the first optical input to

a third optical output when the second mirror is in the fourth position and the optical beam coupling to the second optical output when the first mirror is in the second position and the second mirror is in the fourth position, the first optical input being separated from the second optical output by about 12-57 mm.

17. The optical cross connect of claim 16 wherein the first mirror is a two-sided mirror and further comprising a second optical input wherein the first mirror reflects a second optical beam from the second optical input to the second optical output when the first mirror is in the first position.

18. A micro-electro-mechanical system ("MEMs") optical cross connect comprising:

a mounting substrate having a mounting surface;

a first latching MEMs optical switch cell affixed to the mounting surface and aligned to direct a first optical beam from a first optical input to a first optical output when a first mirror of the first MEMs optical switch cell is latched in an extended position; and

a second MEMs optical switch cell affixed to the mounting surface and aligned to direct the first optical beam from the first optical input to a second optical output when a second mirror of the second MEMs optical switch cell is latched in a second extended position and the first mirror is rotated in a plane essentially normal to the mounting surface out of the beam path to latch in a retracted position.

19. The optical cross connect of claim 18 wherein the first mirror in the extended position extends above an edge of the first latching MEMS optical switch cell at least 400 microns.

20. An optical cross connect comprising:

N optical input ports where N is a first integer;

M optical output ports where M is a second integer; and

N times M micro-electro-mechanical system optical switch dice, each of the micro-electro-mechanical system optical switch dice having a drive capable of switching a mirror from a first position to a second position in response to a switching signal provided to the micro-electro-mechanical switch die.

21. The optical cross connect of claim 20 wherein N=M.

22. The optical cross connect of claim 20 wherein the drive is a magnetic drive.

23. The optical cross connect of claim 22 wherein the switching signal has a maximum voltage less than 10 Volts.

24. The optical cross connect of claim 21 wherein the optical cross connect switches 2N optical switch dice in less than about 50 mS with an average power consumption of less than about 2N/50 Watts.

25. A method for assembling an optical cross connect, the method comprising:

providing a mounting substrate with a first optical input, a second optical input, a first optical output, and a second optical output;

optically aligning a first micro-electro-mechanical system die with a first optical switching element to direct a first optical beam from the first optical input to the first optical output;

affixing the first micro-electro-mechanical system die to the mounting substrate;

optically aligning a second micro-electro-mechanical system die with a second optical switching element to direct a second optical beam from the second optical input to the second optical output; and

affixing the second micro-electro-mechanical system die to the mounting substrate.

26. The method of claim 25 further comprising a step, after the affixing the first micro-electro-mechanical system die step, of latching the first optical switching element in a retracted position.

27. The method of claim 26 wherein the latching step comprises applying a mechanical force.

28. The method of claim 25 wherein the first optical switching element is a mirror and the second optical switching element is a mirror and further comprising steps of:

selecting the first micro-electro-mechanical system die according to a first mirror criterium; and

selecting the second micro-electro-mechanical system die according to a second mirror cirterium.

29. A method for operating an optical cross connect, the method comprising:

measuring an impedance of a first circuit of a first optical switch in the optical cross connect;

comparing the impedance to a reference value to determine a switch state of the first optical switch;

providing a switch state output; and

comparing the switch state output to an expected switch state.

30. The method of claim 29 further comprising a step, after the comparing the switch state output, if the switch state output is not the expected switch state, of providing a switching signal to the first optical switch.

31. The method of claim 29 further comprising a step, after the comparing the switch state output, if the switch state output is not the expected switch state, of generating an error signal identifying the first optical switch in the optical cross connect.

32. The method of claim 31 further comprising a step of, after the comparing the switch state output, if the switch state output is the expected switch state, measuring a second impedance of a second circuit of a second optical switch in the optical cross connect.

33. A method for operating an optical cross connect having a plurality of optical switches, each of the optical switches having a magnetic drive , the method comprising:

measuring an impedance of a first circuit of a first optical switch in the optical cross connect;

comparing the impedance to a reference value to determine a state of the first optical switch;

providing a switch state output; and

comparing the switch state output to an expected switch state; and, if the switch state output is not the expected switch state,

providing a switching signal to the first optical switch.

34. A method for operating an optical cross connect having a plurality of optical switches, each of the optical switches having a magnetic drive , the method comprising:

measuring an impedance of a first circuit of a first optical switch in the optical cross connect;

comparing the impedance to a reference value to determine a state of the first optical switch;

providing a switch state output; and

comparing the switch state output to an expected switch state; and, if the switch state output is not the expected switch state,

providing a switching signal to the first optical switch; and

generating an error signal identifying the first optical switch in the optical cross connect.

35. A method of determining a configuration of an optical cross connect having N optical inputs, M optical outputs, and NxM optical switching cells where N and M are integers, the method comprising:

measuring an impedance for each of the NxM optical switching cells;

comparing the measured impedance of each of the NxM optical switching cells against a reference value; and

generating a switch state signal for each of the NxM optical switching cells.

36. The method of claim 35 further comprising steps of:

comparing each of the switch state signals against a corresponding expected switch state; and, if an optical switching cell is not in an expected state,

generating an error signal identifying the optical switching cell that is not in the expected state.

37. A method of operating an optical cross connect, the method comprising:

providing a plurality of electronic control signals to a plurality of micro-electro-mechanical system optical switch dice in the optical cross connect to configure the optical cross connect to a selected configuration;

removing electrical input to the optical cross connect; and

maintaining the selected configuration.